

**(This annex is not a mandatory part of the referring ASHRAE SSPC 300 standard or guideline. It is merely informative and does not contain requirements necessary for conformance to the standard or guideline.)**

**(The following informative annex is provided to illustrate, explain, or support the ASHRAE SSPC 300 commissioning process. The information presented herein represents consensus good practice but does not contain mandatory commissioning process provisions. This informative annex supports more than one ASHRAE SSPC 300 commissioning standard or guideline and is not intended to serve as a standalone document. See the referring ASHRAE SSPC 300 standard or guideline for mandatory commissioning process requirements and guidance.)**

## **ASHRAE SSPC 300 INFORMATIVE ANNEX 08—DESIGN REVIEW AND REPORT**

This annex provides an example of how to implement a Commissioning Process (Cx) Design Review, as directed by the Owner.

### **08.1 Design Submissions**

A critical step in the Cx is the review of design submissions from the design professionals. It is important to remember that the role of the Cx Provider (CxP) is to verify that the Owner's Project Requirements (OPR) are met, and that the system is designed in a quality manner. There are three distinct types of reviews that can be completed on a drawing set: general, coordination, and field specific. A review of the specifications is also required.

The focus of the Cx Design Review must be defined in the OPR. The Cx Plan can also add requirements and information to the Cx Design Review process and procedures.

### **08.2 Design Review Purpose**

The purpose of the Design Review by the CxP is to review whether or not the design satisfies the OPR, and to confirm that the completed systems can be adequately commissioned.

It is a best practice to keep the Design Review comment list simple, clear, and concise. Gratuitous comments are not productive, nor are they typically responded to by the Design Team. It is important that comments add value to the project. If a comment does not add value, it is best left to those who are creating the design documents to find issues and address them.

During the Design Review, the CxP should focus on the systems/equipment/assemblies that have been identified as being within the scope of the commissioning process.

### **08.3 Design Review Process**

- a. Based on the focus of the Cx Design Review as defined in the OPR and approved by the Owner, develop a procedure by design discipline included in the Cx scope.
- b. Perform a quick general review:
  1. The general review is intended to familiarize the reviewer with the submission.
  2. If, during the general review, significant items are identified as missing (relative to the submission content requirements), then the review process should be stopped, the Owner should be contacted to confirm whether or not the Cx Design Review should continue, and the design professionals should be contacted to discuss the submission concerns.
  3. If the Owner directs the review to proceed, move on to the Design Review.
- c. Areas of concern should:
  1. Identify locations in the design documents where the concern was identified,
  2. Request clarification or provide a narrative regarding the concern,
  3. If appropriate, make a recommendation for the designer to consider, and
  4. Identify the area of the OPR affected.
- d. Determine the review sampling procedure as defined in the project OPR and Cx Plan. The sampling and depth of the Design Review should be based on the complexity and criticality of the facility being

commissioned. A mission critical facility would warrant a more detailed Design Review than a typical office building. The level of detail in the Design Review should be established as part of the CxP contracting process.

- e. During the review of the drawings and specifications, keep detailed notes of problems found or concerns with certain items. At the end of the Design Review, a general summary of the quality of the design drawings should be developed. A letter detailing the quality of the drawings should then be sent to the design professionals and to the Owner with specific recommendations and directions given.
- f. Findings of deficiencies in design documents are typically system specific, so an Owner would be unlikely to know how to list them in the OPR, even if they Owner wanted to put emphases on the review of a particular project.

## 08.4 Design Review Criteria

### 08.4.1 General Items to Review:

- a. Are these systems thoughtfully designed, with proper service clearances?
- b. Is there adequate valving for isolation to facilitate future maintenance or expansion of the system?
- c. Does the design reflect and capture the Owner's need for system redundancy and future expansion?
- d. Are specific environmental control needs addressed with appropriate systems and equipment?
- e. Are air systems equipped with balancing dampers on supply, return, and exhaust branches?
- f. For large air handlers with multiple coils, are there balancing valves on each coil?

### 08.4.2 Big-Picture Items to Review:

- a. Checking capacity of central heating and chilled water plants early in the design and comparing them to rules of thumb. Request calculations from the engineer when system sizing appears to be suspect.
- b. Look for things that can cause problems, during construction, such as pinch points where the structure may interfere with ductwork or equipment operation/maintenance.
- c. Review floor-to-floor heights and focus on the structural drawings, looking for deep beams. Look for places where ductwork, cable trays, and beams converge.
- d. Verify that storm and sanitary piping are coordinated with the other plumbing systems, wiring, and ductwork. Look for interferences.

### 08.4.3 HVAC Items to Review:

- a. System diagrams
- b. Process and instrumentation diagrams
- c. Sequences of operations
- d. Problems with how engineering concepts are pieced together to support newer technologies, such as ground-source heat pumps, chilled beams, radiant heating and cooling, solar thermal, heat recovery, etc.

## 08.5 Design Review Report

The Design Review report should contain the following information:

### 08.5.1 Report Page Header. Project title, number, and date of review

### 08.5.2 Contents

- a. **Executive Summary:** Include a summary of the process used for the review and for processing comments and responses.
- b. **List of Documents Reviewed by Title and Issue Number or Date:** Include a list of all the documents reviewed.
- c. **Issues, Comments, and Variances from OPR:** Include copies of all reviews, distribution lists, and responses.
- d. **Coordination of Drawings and Systems:** Include a copy of the reviews on drawings and systems coordination.

- e. **Access, Constructability, and Maintainability Questions and Recommendations:** Include a copy of the reviews on systems and assemblies' access, constructability, and maintainability.

**08.6 Design Professional Actions.** Comments provided by the CxP need to be formally replied to by the design professionals. If systemic issues are identified during the CxP's review, the design process should be resolved. Backchecking of the specific items may be appropriate, but not as the sole means of verifying resolution of the issue.

**08.7 Example Checklist.** The following checklist provides an example of the topics which a review may cover; such a checklist can be made part of the OPR. Various levels of details/price could be presented during the contract negotiations between the CxP and the Owner, to arrive at an appropriate scope that meets the Owner's needs.

### **EXAMPLE**

**Review Goals.** The commissioning review will focus on evaluating the basic design concepts, objectives, and criteria proposed by the project engineer. The review will cover the following items:

- a. Appropriateness of the mechanical strategies for the project
- b. Effectiveness of the strategies at creating comfortable, healthy indoor environments
- c. Energy efficiency of the proposed systems
- d. Constructability of the systems and integration into architectural and structural systems

A secondary goal of this review is to meet the LEED® v4 NC requirement for Energy and Atmosphere Credit 1: Enhanced Commissioning.

**Review Activities and Deliverables.** We will use our engineering experience and knowledge supported by analytical calculations as needed to determine the suitability of the proposed mechanical systems in achieving project goals. We will meet with the Design Team to discuss the design objectives and participate in a discussion of the project functions and performance goals. The meeting will also serve as a forum to develop and discuss value engineering alternatives.

We will review in detail the plans and narratives, and analyze them based on the following criteria:

- a. **System Appropriateness.** We will begin by assessing the appropriateness of the chosen systems. This assessment will consider energy efficiency, long-term maintenance, flexibility, and overall value/cost-effectiveness for the Owner.
- b. **System Layout.** We will examine the equipment and components that constitute the chosen systems. This will include a review of the layout and equipment selections for chiller plants, boiler plants, air handlers, air distribution systems, hydronic systems, life safety systems, etc.
- c. **Value Engineering.** We will provide ideas to improve the cost/benefit ratio of the system. This may include measures that both increase and decrease first cost; our intent is to increase value, not to cut costs.
- d. **Energy Efficiency and Title 24 Energy Code Compliance.** We will review the drawings and specifications to identify potential energy conservation measures not already included in the design. We will also identify any areas where the project may not be in compliance with the Title 24 prescriptive mechanical measures. We will use our experience and judgement to point out areas of potential problems; we will not perform detailed energy code compliance analysis.
- e. **Building Automation Systems.** The design of the control system and control sequences are a key element to the overall success of a mechanical system. We will review the control system design for all HVAC systems and equipment.
- f. **Coordination and Constructability.** We will review drawings to see if major elements have been reasonably coordinated with structural and architectural constraints, and with electrical and plumbing designs. (We will include only review of major elements; we will not provide shop drawing level coordination.)
- g. **Building Code Compliance.** We will review the design for general mechanical code compliance, based on our knowledge of codes and standards, and experience on other projects. This is intended to augment, not



replace, a code compliance review by the project's code consultant.

- h. **Specifications.** We will provide a summary review of the specifications for Division 23 (HVAC), Division 25 (Controls), and Division 22 (Plumbing).

After each review, we will provide a log of comments with space for the design engineers to respond. We will review their responses and provide additional comments if necessary.